

REMARKS

Claims 2, 3, 5 - 8, 21, 22, and 26 - 30 have been amended. Claims 10 and 23 - 25 have been cancelled. Claims 31 - 42 have been added. Accordingly, Claims 2, 3, 5 - 8, 21, 22, and 26 - 42 are now pending.

Claims 2, 3, 5 - 8, 10, 21, and 22 have been objected to on the grounds that the terms "terminal A" and "terminal K" in the last four lines of Claim 8 and in the last seven lines of Claim 21 should respectively read "the terminal A" and "the terminal K". This objection is respectfully traversed in view of the revisions to the claims.

The terms "first terminal A" and "second terminal K" as they first occur in each of Claims 8 and 21 have been respectively shortened to "first terminal" and "second terminal" by deleting "A" and "K". Subsequent references to "terminal A" and "terminal K" in Claims 8 and 21 and in their dependent claims have been respectively changed to "said first terminal" and "said second terminal" in conformity with accepted claim phraseology. In light of these changes, the objection relating to the wording used to recite the terminals in the claims should be withdrawn.

Claims 2, 3, 5 - 8, 10, and 21 - 30 have been rejected under 35 USC 112 as containing subject matter not described in the specification in such a way as to enable a person skilled in the art to make and use the invention. Taking note of the cancellation of Claims 10 and 23 - 25, this rejection is respectfully traversed.

The Examiner first notes that Claims 2, 3, 5 - 8, 10, and 21 - 30 "recite the subject matter(s) involving a coupling of terminal A—first current source—first resistor—terminal K and the coupling of terminal A—second resistor—second—terminal K, and/or the current sources each include a pair of back-to-back Zener diodes" and that "These subject matters are apparently associated with the embodiments of Figs. 12-14". The examiner then alleges that "these associated embodiments are not enabled by the disclosure, because a current source as commonly recognized in the art is defined as an electrical power source that can supply a current at a fixed current level, just like a voltage source that can supply a voltage at a fixed voltage level, and the disclosure fails to describe: (1) how and by what means such a type of current sources can be activated (see page 18, lines 23-30); (2) how the current source can be formed of a pair of back-to-back Zener diodes (see page 19, lines 13-26), given the fact that a diode itself can only serve as a voltage source (see page 20, lines 1-2; and (3) how the base of the bipolar transistor (130 or 150, Fig. 3) can be directly or equivalently connected to both

Ronald J. Meetin
Attorney at Law
210 Central Avenue
Mountain View, CA
94043-4869
Tel.: 650-964-9767
Fax: 650-964-9779

of the current source (770 or 772) and the resistor (756 or 758), given the fact that the base region is a lightly doped region, which itself always has residual resistance when connected to the outside".

A U.S. patent application need not describe details on how to implement items whose implementation is routine to persons skilled in the art. A current source is one such item whose implementation is a routine matter to a skilled artisan. It is well known that a current source can be implemented in any of the following ways: (a) a resistor¹, (b) a transistor provided with a suitable control voltage, e.g., a bipolar transistor whose base receives the control voltage, and (c) a series combination of a resistor and a transistor provided with a suitable voltage, e.g., a bipolar transistor with an emitter resistor. Gray et al, Analysis and Design of Analog Integrated Circuits (John Wiley & Sons), 1997, pps. 197 - 210, copy enclosed, describes various transistor current sources. Consequently, the fact that the specification of the present application does not present implementation details on the current sources recited in the specification does not create a 35 USC 112 enablement deficiency for any of pending Claims 2, 3, 5 - 8, 21, 22, and 26 - 30.

As to the Examiner's comment that the specification does not describe how the recited current sources are activated, there is no need for the specification to describe how these current sources are activated because the activation of a current source is a routine matter for a person skilled in the art. For example, if a current source is implemented simply with a resistor, the current source is activated whenever there is a voltage across the resistor. For a current source formed with a transistor and possibly a series resistor, the current source is activated whenever the control voltage to the transistor is at a suitable value. This can be achieved by generating the control voltage in any of a number of ways that are routine to a person skilled in the art. Hence, the absence of information in the specification on the techniques and manner for activating the recited current sources does not create a 35 USC 112 deficiency for any of Claims 2, 3, 5 - 8, 21, 22, and 26 - 30.

Ronald J. Meetin
Attorney at Law
210 Central Avenue
Mountain View, CA
94043-4869
Tel.: 650-964-9767
Fax: 650-964-9779

¹ Note that the Examiner's comment about a current source providing current at a fixed level is a simplification. All that is generally required for an item that is, or can be, described as a current source in many, perhaps the vast majority, of circuits is that the current source provide current at a level which is roughly constant depending on the requirements of the circuit. This is why a current source is commonly implemented with a resistor despite the fact that the voltage across, and thus the current through, the resistor commonly changes during circuit operation.

With respect to the Examiner's comment that the specification does not disclose how a current source can be formed with a pair of back-to-back Zener diodes, Claim 10 has been cancelled. As a result, none of the claims subjected to the 35 USC 122 non-enablement rejection recite that a current source contains a diode such as a Zener diode. Nor do any of new Claims 31 - 42 recite that a current source contains a diode. The Examiner's comment that the specification fails to describe how a current source can be formed with a pair of back-to-back Zener diodes is therefore not pertinent to any of the pending claims and thus does not provide a reason for rejecting any of the pending claims.

As to the Examiner's comment that the specification fails to disclose "how the base of the bipolar transistor (130 or 150, Fig. 3) can be directly or equivalently connected to both of the current source (770 or 772) and the resistor (756 or 758), given the fact that the base region is a lightly doped region, which itself always has residual resistance when connected to the outside", the specification does indeed present such a disclosure. As far as Applicants' Attorney can determine, this disclosure is accurate. Any lack of understanding on the Examiner's part as to why the indicated circuit is operative with the base of a bipolar transistor connected to both a resistor and a current source does not serve as a basis for a 35 USC 112 non-enablement rejection².

For the preceding reasons, the 35 USC 112 non-enablement rejection should be withdrawn.

Claims 2, 3, 5 -8, 21, 22, and 26 - 30 have been rejected under 35 USC 103(a) as obvious based on Huang et al ("Huang") in view of Kim and/or Jonassen. This rejection is respectfully traversed.

The Examiner generally describes Huang's bidirectional switching structure on page 4 of the Office Action. After noting that "Huang does not expressly disclose that the bi-directional switch structure can [be] used in an ESD protection structure and that two power sources each including a pair of back-to-back Zener diodes in series with a resistor are connected in parallel to the two terminals", the Examiner alleges that "one of ordinary skill in the art would readily recognize that such a bi-directional switch structure can be desirably

Ronald J. Meetin
Attorney at Law
210 Central Avenue
Mountain View, CA
94043-4869
Tel.: 650-964-9767
Fax: 650-964-9779

² If the Examiner wants to understand this matter further, Applicants' Attorney invites the Examiner to telephone Applicants' Attorney to discuss the matter.

used in an ESD protection structure for achieving bi-directional ESD protection, as evidenced in Kim (see Figs. 3 and 4)".

Next, the Examiner states that "Jonassen discloses a voltage surge protection structure (Fig. 4) having a pair of back-to-back Zener diodes (13 and 14) in series with resistors (20 and 20') in parallel to the two terminal of the protection structure (11)". The Examiner then alleges that "It would therefore have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate one or two pairs of Jonassen's back-to-back diodes in series with one or two resistors into the bidirectional switch structure of Huang and apply it is to an ESD protection structure, so that an ESD protection [structure] with improved time response and voltage imbalance conditions would be obtained, per the teachings of Kim and/or Jonassen".

The switching, and thus the current flow, through Huang's bidirectional switching structure is controlled either by transistors 40 and 41 or by transistor 49. For Huang's switching circuit to be suitable for ESD protection in accordance with the Examiner's allegation, it would be necessary for the switching of transistors 40 and 41, or the switching of transistor 49, to be controlled so that current starts flowing through Huang's structure immediately after a voltage is applied between terminals 33 and 34. If the switching of either transistors 40 and 41 or transistor 49 were not controlled in this manner, the application of a high voltage (characteristic of typical ESD) between terminals 33 and 34 could readily damage, and possibly burn out, Huang's structure.

Nowhere disclose, or suggest, that either transistors 40 and 41 or transistor 49 is controlled so as to permit current to flow through Huang's structure immediately after a voltage is applied between terminals 33 and 34. Huang's switching circuit is not intended, and is not suitable, for ESD protection. Contrary to what the Examiner alleges, Huang's structure is not desirable for use in an ESD protection structure. It would not be obvious to apply the teachings of Kim and/or Jonassen to Huang in an effort to obtain the subject matter of Claim 8 or 21. Consequently, Claims 8 and 21 are patentable over Huang taken with Kim and/or Jonassen.

In addition, Claim 8 recites a pair of resistors and a pair of current sources. Claim 21 further recites a pair of resistors and a pair of back-to-back Zener-diode pairs. Claims 8 and 21 have been amended here to recite that one of the resistors is coupled between the first

Ronald J. Meetin
Attorney at Law
210 Central Avenue
Mountain View, CA
94043-4869
Tel.: 650-964-9767
Fax: 650-964-9779

terminal and the second semiconductor region and that the other resistor is coupled between the second terminal and the fourth semiconductor region.

Kim does not disclose any circuit elements corresponding to (a) the resistor pair and the current-source pair of Claim 8 or (b) to the resistor pair and the two Zener-diode pairs of Claim 21. Even if there were some reason for combining Kim and Huang, the combination would not teach the full subject matter of Claim 8 or 21. This is a separate reason why Claims 8 and 21 are patentable over Huang and Kim.

As to Jonassen, it discloses an ESD protection structure formed with a pair of ESD protection components that each separately provide ESD protection but which work together to enhance the ESD protection. One of these components is a multi-electrode gas tube arrester. The other ESD protection component includes a pair of Zener diodes³. Jonassen indicates that a pair of resistors can be in series with the Zener-diode pair.

The Zener-diode component of Jonassen's overall ESD protection structure triggers at a lower voltage than the multi-electrode gas tube arrester. When a sufficiently high voltage imbalance is applied across Jonassen's ESD protection structure, the Zener-diode component triggers first to provide a short circuit for alleviating the voltage imbalance. If the voltage imbalance continues and is of a magnitude that could damage the Zener-diode component, the multi-electrode gas tube arrester triggers to provide a further short circuit for alleviating the voltage imbalance. See col. 2 of Jonassen. The Zener-diode component thus cooperates with the multi-electrode gas tube arrester in providing ESD protection.

The resistor pair and the current-source pair of Claim 8 control the magnitude of the voltage at which the ESD protection structure of Claim 8 triggers (goes into action). See pages 17 and 18 of the specification. Similar comments apply to Claim 21. With reference to pages 18 and 19 of the specification, the resistor pair and the two Zener-diode pairs of Claim 21 control the trigger voltage of the ESD protection structure of Claim 21.

The multi-electrode gas tube arrester and the Zener-diode component in Jonassen trigger at separate voltages determined by the characteristics of those two components. Jonassen's Zener-diode component is not employed to perform the same function as the resistor pair and the current source pair of Claim 8 or the resistor pair and the two Zener-

Ronald J. Meetin
Attorney at Law
210 Central Avenue
Mountain View, CA
94043-4869
Tel.: 650-964-9767
Fax: 650-964-9779

³ Jonassen verbally describes the Zener diodes as being in a back-to-back configuration but, in Figs. 3 and 4, illustrates them in a front-to-front configuration.

diode pairs of Claim 21. Jonassen's Zener-diode component does not control the trigger voltage of the multi-electrode gas tube arrester. A person skilled in the art would therefore have no reason for applying the teachings of Jonassen to those of Huang. This is an additional reason why Claims 8 and 21 are patentable over Huang and Jonassen taken with or without Kim.

As mentioned above, Claims 8 and 21 each recite that the first resistor is coupled to the second semiconductor region and that the second resistor is coupled to the fourth semiconductor region. Nothing in Jonassen discloses or suggests these resistor couplings. This further distinguishes Jonassen from the subject matter recited in Claim 21, thereby further showing why Claims 8 and 21 are patentable over Huang combined with Kim and/or Jonassen.

Claims 2, 3, 5 - 7, 22, and 26 - 30 all variously depend (directly or indirectly) from Claims 8 and 21. Consequently, dependent Claims 2, 3, 5 - 7, 22 and 26 - 30 are patentable over Huang taken with Kim and/or Jonassen for the same reasons as Claims 8 and 21. The same applies to new Claims 31 and 32 since they respectively depend from Claims 8 and 21.

New independent Claim 33 is directed to a method in which an ESD protection structure containing five different semiconductor regions is subjected to a voltage whose magnitude is greater than a trigger voltage such that the voltage is placed across a pair of terminals connected to the ESD structure and such that current for dissipating the voltage automatically flows through the ESD structure when the voltage is placed across the terminal. As discussed above, Huang is not suitable for ESD protection. Consequently, Claim 33 is patentable over Huang taken with Kim and/or Jonassen. The same applies to new Claims 34 - 42 since they all depend (directly or indirectly) from Claim 33.

In addition, dependent Claim 38 recites that the ESD structure is formed with a pair of resistors and a pair of current sources analogous to what is recited in Claim 8. Dependent Claim 40 recites that the ESD structure is formed with a pair of resistors and a pair of back-to-back diode pairs analogous to what is recited in Claim 21. For the reasons presented above in connection with Claims 8 and 21, nothing in Kim and/or Jonassen would provide a person skilled in the art with any motivation or suggestion for combining the further material of Claim 38 or 40 with that of Claim 33. A separate basis is thereby provided for allowing Claims 38 and 40 over Huang taken with Kim and/or Jonassen. The same applies to new Claims 39, 41, and 42 since they variously depend from Claims 38 and 40.

Ronald J. Meetin
Attorney at Law
210 Central Avenue
Mountain View, CA
94043-4869
Tel.: 650-964-9767
Fax: 650-964-9779

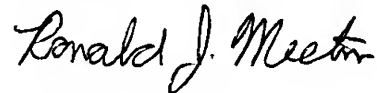
In short, the 35 USC 112 non-enablement rejection is inappropriate and should be withdrawn. Claims 2, 3, 5 - 8, 21, 22, and 26 - 42 have been shown to be patentable over the applied art. Accordingly, Claims 2, 3, 5 - 8, 21, 22, and 26 - 42 should be allowed so that the application may proceed to issue.

Please telephone Attorney for Applicant(s) at 650-964-9767 if there are any questions.

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Respectfully submitted,



Ronald J. Meetin
Attorney for Applicant(s)
Reg. No. 29,089

210 Central Avenue
Mountain View, CA 94043-4869

Ronald J. Meetin
Attorney at Law
210 Central Avenue
Mountain View, CA
94043-4869

Tel.: 650-964-9767
Fax: 650-964-9779